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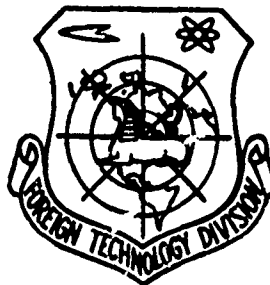
## FOREIGN TECHNOLOGY DIVISION



AQUEOUS, MINERAL OIL AND NITRATE-FREE  
COOLING LUBRICANT FOR NONCUTTING AND  
CUTTING METAL WORKING

by

Martin Landbeck



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| Cutting Fluid<br>Ethylene Glycol<br>Fatty Acid<br>Lubricant Additive<br>Sulfonation<br>Aqueous Solution<br>Patent |        |    |        |    |        |    |

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## EDITED TRANSLATION

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**AQUEOUS, MINERAL OIL AND NITRATE-FREE  
COOLING LUBRICANT FOR NONCUTTING AND  
CUTTING METAL WORKING**

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Inventor and Holder

The invention deals with an aqueous, mineral oil and nitrate-free cooling lubricant for the noncutting and cutting metal working.

In the metal working industry mineral oils are used that can be emulsified in water for cutting and shaping techniques. They are known under the name drill oils and in addition they have extraordinary cooling properties with good lubricating characteristics. In production of this type the disadvantage is that they have a relatively fast decomposition due to the influence of bacteria. Thus, this often leads to a decrease in corrosion protection characteristics and disagreeable orders are formed. Furthermore, mineral oil emulsions are used prior to being drained in the waste water must be subjected to a separation process in order to remove as much of the mineral oil as possible. This procedure is usually connected with considerable expense.

Drilling oil emulsions have generally a ph-value of approximately 9. For this reason they are not suitable for working with light metals as, for example, aluminum. They can also not be used in working processes in which it is necessary to observe the work piece.

Very frequently aqueous coolants such as sodium nitrite, organic bases and, when indicated, friction reducing materials are used for cooling during grinding. These can crystallize during water evaporation in connection with which the lubricating effect is influenced or completely lost. They are also partially rejected due to the toxic sodium nitrite that they contain. Nitrites cannot be in the drainage water so that here too the solutions that are used must be processed. Due to their alkaline action they cannot be used in the above mentioned grinding liquids in processing light metals.

It was already proposed to introduce aqueous solutions of the salts from sulfamido carboxylic acids in order to process metals. Cooling lubricants of this type have, of course, satisfactory corrosion protection characteristics, however, in most cases the lubricating effect is not sufficient.

It was also proposed to use aqueous solutions of polyethylene glycols of various molecular weights for noncutting and cutting metal working. Polyethylene glycols are good lubricants but do not have any rust inhibiting characteristics. Cooling lubricants which contain polyethylene glycol must be built with corrosion inhibiting additives. In most cases sodium nitrite was used for this purpose which had the above mentioned disadvantages.

The purpose of this invention is to produce coolants that are soluble in water with a clearness of up to 20° dH or are slightly turbid, must not have any toxic ingredients, and which can be carried away in the drainage water without any previous treatment and which, as a result of its resistance to the influence of bacteria, has a long service life. The corrosion inhibiting effect as well as the influence of friction and the rare characteristics of the tools and materials should be within the framework of the well known characteristics of standard drilling oils. The processing of light metals should be made possible through a suitably low pH value content.

The purpose of the invention is to produce a cooling lubricant with the above mentioned characteristics through the combination of suitable polyalkaline glycols with sulfamido carboxylic acids or their salts and perhaps additional additives in order to improve solubility.

The problem is solved by a cooling lubricant consisting of from 5 to 50% by weight of sulfonamide carboxylic acids or their salts having the general formula



in which R is an aliphatic radical with at least 6 C atoms and  $X:Na^+, K^+, H^+$  or another monovalent cation, 5 to 20% by weight of a polyalkaline glycol with a molecular weight of from 200 to 1500, advantageously 200 to 600, 0 to 10% by weight of the sodium salt of a high sulfated straight chain monofatty acid, 1 to 3% by weight of an organic base, preferably triethanolamine and 0 to 5% by weight alkanolamine of monofatty acids, preferably unsaturated fatty acids as well as a suitable amount of water.

The combination just described is capable of absorbing a certain amount of hydrocarbons which may be contained in the alkylsulfamidoacetic acid which was probably still contained from the manufacture.

Tests in noncutting and cutting metal working have shown that in accordance with the invention the cooling lubricant is satisfactory with reference to the required lubricating effect, which was measured by the tool life, service life (not attacked by bacteria and no foul smell), cooling effect, physiological effect (no principle effect), transparency in water to 20° dH and corrosion protection (temporary corrosion protection during the processing procedures).

The product in accordance with the invention furthermore satisfies requirements to which mineral oil containing or nitrite containing cooling lubricants are not equal to. This is the case in deformation work with metals which is followed by a heat treatment. When using drilling oils that contain mineral oil or grinding material containing nitrite then in these cases it is followed by very rough and/or the formation of spots.

Example:

A mixture containing 40% by weight of sodium salts of alkylsulfamidoacetic acid with an average chain length of 15 C atoms (possibly as a commercial product with a certain amount of paraffin hydrocarbon) are stirred together at room temperature with 47.5% by weight water, 10% by weight polyethyl glycol with the average molecular weight of 200, 1.5% by weight of a sodium salt of highly sulfanated fatty acids (sulfating degree 96%, effective substance approximately 60%) and 1% by weight of triethanolamine until a clear solution is obtained. This product results in a solution having a pH value of approximately 7.5 which is suitable for noncutting and cutting metal working when diluted with water in a ratio of 1:20.

Patent claim:

An aqueous mineral oil and nitrite-free cooling lubricant for noncutting and cutting metal working characterized by a combination of alkylsulfamido carboxylic acids or their salts with a chain length of at least 6 C atoms with polyethylene glycols having a molecular weight of from 200 to 1500 and if necessary additional additives to improve the dissolvability characteristics and the corrosion protection, such as organic bases, preferably triethanolamine, alkanolamine or alkaline salts of unsaturated straight chained monofatty acids and highly sulfanated fatty acids or other salts.